

# **LOWER PASSAIC RIVER RESTORATION PROJECT**

## **LOWER PASSAIC RIVER STUDY AREA RI/FS**

### **SPRING AND SUMMER 2010 BENTHIC INVERTEBRATE COMMUNITY SURVEYS ADDENDUM TO THE QUALITY ASSURANCE PROJECT PLAN**

### **SURFACE SEDIMENT CHEMICAL ANALYSES AND BENTHIC INVERTEBRATE TOXICITY AND BIOACCUMULATION TESTING**

**FINAL**

**May 17, 2010  
Revision Number: 0  
Addendum Number 1**

**Prepared By:**



200 West Mercer Street, Suite 401  
Seattle, Washington 98119

## Table of Contents

---

<b>Introduction</b>	<b>1</b>
<b>QAPP Worksheet No. 1. Title and Approval Page</b>	<b>2</b>
<b>QAPP Worksheet No. 3. Distribution List</b>	<b>4</b>
<b>QAPP Worksheet No. 10. Problem Definition</b>	<b>6</b>
<b>QAPP Worksheet No. 11. Project Quality Objectives/Systematic Planning Process Statements</b>	<b>8</b>
<b>QAPP Worksheet No. 18. Proposed Sampling Locations and Methods/SOP Requirements Table</b>	<b>10</b>
<b>References</b>	<b>15</b>
<b>Oversize Figure</b>	<b>17</b>

## Acronyms

---

<b>CPG</b>	Cooperating Parties Group
<b>ID</b>	identification
<b>LPRSA</b>	Lower Passaic River Study Area
<b>MLLW</b>	mean lower low water
<b>NJDEP</b>	New Jersey Department of Environmental Protection
<b>NJDOT</b>	New Jersey Department of Transportation
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>QAPP</b>	quality assurance project plan
<b>RM</b>	river mile
<b>SOP</b>	standard operating procedure
<b>USACE</b>	US Army Corps of Engineers
<b>USEPA</b>	US Environmental Protection Agency
<b>USFWS</b>	US Fish and Wildlife Service
<b>Windward</b>	Windward Environmental LLC

## Introduction

---

This is an addendum to the *Lower Passaic River Restoration Project Quality Assurance Project Plan: Surface Sediment Chemical Analyses and Benthic Invertebrate Toxicity and Bioaccumulation Testing* (Windward 2009), hereafter referred to as the Benthic Quality Assurance Project Plan (QAPP). The Benthic QAPP, which was reviewed by the US Environmental Protection Agency (USEPA) and its Partner Agencies<sup>1</sup> and approved by USEPA on October 8, 2009, specified that three benthic invertebrate community surveys would be conducted; these would include a fall 2009 survey, a spring 2010 survey, and a summer 2010 survey. This addendum to the Benthic QAPP, hereafter referred to as Benthic QAPP Addendum No. 1, describes the spring and summer 2010 benthic invertebrate community surveys that will be conducted to qualitatively assess the benthic invertebrate community in the Lower Passaic River Study Area (LPRSA) in the spring and summer months (i.e., May and July/August). Data to be collected will include the total number of taxa (e.g., species) present and the abundance of each species or taxonomic group at a subset of the fall 2009 benthic invertebrate community sampling locations.

The Benthic QAPP Addendum No. 1 includes updates to worksheets relevant to the spring and summer benthic community surveys; it does not include updates to those worksheets or attachments that are not relevant to these sampling events. Applicable and updated worksheets included in this addendum are presented below:

- Worksheet No. 1 contains the title and approval pages for the addendum.
- Worksheet No. 3 provides the distribution list.
- Worksheet No. 10 describes the specific problem definition for the spring and summer benthic invertebrate community surveys.
- Worksheet No. 11 provides a summary of project tasks.
- Worksheet No. 18 provides a list of proposed sampling locations.

---

<sup>1</sup> The Partner Agencies include the US Army Corps of Engineers (USACE), New Jersey Department of Environmental Protection (NJDEP), New Jersey Department of Transportation (NJDOT), National Oceanic and Atmospheric Administration (NOAA), and the US Fish and Wildlife Service (USFWS).

## QAPP Worksheet No. 1. Title and Approval Page

Addendum to the *Quality Assurance Project Plan for Surface Sediment Chemical Analyses and Benthic Invertebrate Toxicity and Bioaccumulation Testing*

Document Title

Windward Environmental LLC (Windward)

Lead Investigative Organization

Helle Andersen, Windward/Karen Tobiason, Windward

Preparer's Name and Organizational Affiliation

200 West Mercer St., Suite 401, Seattle, WA 98119, 206.812.5407, karent@windwardenv.com

Preparer's Address, Telephone Number, and E-mail Address

05/17/10

Preparation Date (mm/dd/yy)

Investigative Organization's Project Manager:

Signature

Lisa Saban, Windward, Date

Printed Name/Organization/Date

Investigative Organization's Task QA/QC  
Manager:

Signature

Tad Deshler, Windward, Date

Printed Name/Organization/Date

Project Coordinators:

Signature

Bill Potter, de maximis, inc., Date

Printed Name/Organization/Date

## QAPP Worksheet No. 1. Title and Approval Page

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Robert Law, de maximis, inc., Date

\_\_\_\_\_  
Printed Name/Organization/Date

Approval Signatures:

USEPA Project Manager

\_\_\_\_\_  
Approval Authority

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Stephanie Vaughn, USEPA, Date

\_\_\_\_\_  
Printed Name/Title/Date

USEPA Project QA Officer

\_\_\_\_\_  
Approval Authority

\_\_\_\_\_  
Signature

\_\_\_\_\_  
William Sy, USEPA, Date

\_\_\_\_\_  
Printed Name/Title/Date

### QAPP Worksheet No. 3. Distribution List

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address
Lisa Saban	Investigative Organization Project Manager	Windward	206.812.5429	<a href="mailto:lisas@windwardenv.com">lisas@windwardenv.com</a>
Mike Johns	Technical Advisory Team Member	Windward	206.812.5418	<a href="mailto:mikej@windwardenv.com">mikej@windwardenv.com</a>
Tad Deshler	Investigative Organization Task QA/QC Manager	Windward	206.812.5406	<a href="mailto:tad@windwardenv.com">tad@windwardenv.com</a>
Kimberley Goffman	Investigative Organization Information Manager	Windward	206.812.5414	<a href="mailto:king@windwardenv.com">king@windwardenv.com</a>
Thai Do	Field Coordinator/Site Safety and Health Officer	Windward	206.812.5407	<a href="mailto:thaid@windwardenv.com">thaid@windwardenv.com</a>
Angelita Rodriquez	Field Coordinator/Site Safety and Health Officer (alternate)	Windward	512.436.8645	<a href="mailto:angelitar@windwardenv.com">angelitar@windwardenv.com</a>
Suzanne Replinger	Field Personnel	Windward	206.812.5435	<a href="mailto:suzanner@windwardenv.com">suzanner@windwardenv.com</a>
Mike Yarnes	Field Personnel	Windward	206.812.5430	<a href="mailto:mikey@windwardenv.com">mikey@windwardenv.com</a>
Rick Berg	Field Personnel	Windward	206.812.5428	<a href="mailto:rickb@windwardenv.com">rickb@windwardenv.com</a>
Sarah Fowler	Field Personnel	Windward	206.812.5440	<a href="mailto:sarahf@windwardenv.com">sarahf@windwardenv.com</a>
Bill Potter/Robert Law	Project Coordinators	de maximis, inc.	908.735.9315	<a href="mailto:otto@demaximis.com">otto@demaximis.com</a> <a href="mailto:rlaw@demaximis.com">rlaw@demaximis.com</a>
William Hyatt	Coordinating Counsel	K&L Gates	973.848.4045	<a href="mailto:william.hyatt@klgates.com">william.hyatt@klgates.com</a>
Eric Parker	Boat Operator	Research Support Services, Inc.	206.550.5202	<a href="mailto:eparker@rssincorporated.com">eparker@rssincorporated.com</a>
Jeff Clemens	Boat Operator (Alternate)	Aqua Survey, Inc.	908.347.3927	<a href="mailto:clemens@aquasurvey.com">clemens@aquasurvey.com</a>
Gary Lester	Biological Laboratory Project Manager	EcoAnalysts, Inc.	208.882.2588 ext. 21	<a href="mailto:glester@ecoanalysts.com">glester@ecoanalysts.com</a>
Stephanie Vaughn	USEPA Project Manager	USEPA Region 2	212.637.3914	<a href="mailto:vaughn.stephanie@epamail.epa.gov">vaughn.stephanie@epamail.epa.gov</a>

**QAPP Worksheet No. 3. Distribution List**

<b>QAPP Recipients</b>	<b>Title</b>	<b>Organization</b>	<b>Telephone Number</b>	<b>E-mail Address</b>
Chuck Nace	USEPA Risk Assessor	USEPA Region 2	212.637.4164	<a href="mailto:nace.charles@epa.gov">nace.charles@epa.gov</a>
Lisa Baron	Project Manager	USACE	917.790.8306	<a href="mailto:Lisa.A.Baron@usace.army.mil">Lisa.A.Baron@usace.army.mil</a>
Janine MacGregor	Project Coordinator	NJDEP	609.633.0784	<a href="mailto:Janine.MacGregor@dep.state.nj.us">Janine.MacGregor@dep.state.nj.us</a>
Timothy Kubiak	Assistant Supervisor of Environmental Contaminants	USFWS	609.646.9310, ext. 26	<a href="mailto:tim_kubiak@fws.gov">tim_kubiak@fws.gov</a>
Reyhan Mehran	Coastal Resource Coordinator	NOAA	212.637.3257	<a href="mailto:reyhan.mehran@noaa.gov">reyhan.mehran@noaa.gov</a>

## QAPP Worksheet No. 10. Problem Definition

### The problem to be addressed by the project:

The second and third of three seasonal benthic invertebrate community surveys will be conducted to provide seasonal information on the benthic invertebrate community in the LPRSA. This information will complement the benthic invertebrate community survey conducted in the LPRSA during fall 2009 (Windward, in prep).

### The environmental questions being asked:

The specific question defined for the spring and summer 2010 benthic invertebrate community surveys addressed in this addendum is: "What is the qualitative seasonal variability of diversity and abundance in the LPRSA benthic community?"

### The rationale for sample locations:

As described in the Benthic QAPP (Windward 2009), the spring and summer benthic invertebrate community surveys will be conducted on a subset of locations sampled during the fall 2009 benthic field effort. Thirty-three locations (approximately 30% of the fall 2009 benthic community sampling locations) will be resampled during the second and third surveys based on results from the fall 2009 benthic community survey and on the following approach:

- Samples include locations in both estuarine and freshwater zones (defined in the Benthic QAPP as River Mile (RM) 0 to RM 8.5 and RM 8.5 to RM 17.4, for estuarine and freshwater zones, respectively) and represent each habitat type (i.e., coarse/deep water, coarse/shallow water, fine/deep water, and fine/shallow water).
- Sampling locations are based on fall 2009 benthic invertebrate community survey locations and include a range (i.e., high to low) of abundance and diversity.
- Two sampling locations per river mile (one shallow water and one deep water) are located between River Mile (RM) 0 and RM 16, and one sampling location (shallow water) is located between RM 16 and RM 17.4.

Sixteen locations, between RM 0 and RM 8.5, are distributed within the four habitat types as follows:

- Five deep-water locations with coarse substrate
- Two shallow-water locations with coarse substrate
- Three deep-water locations with fine substrate
- Six shallow-water locations with fine substrate

Seventeen locations, between RM 8.5 to RM 17.4, are distributed within the four habitat types as follows:

- Five deep-water locations with coarse substrate



### QAPP Worksheet No. 10. Problem Definition

- Eight shallow-water locations with coarse substrate
- One deep-water location with fine substrate
- Three shallow locations with fine substrate

**Project decision conditions:**

The conditions for project decisions (i.e., those decisions that may require communication between the Cooperating Parties Group (CPG) and USEPA during the field event) include the need to relocate sampling locations within the LPRSA, adjust sampling methods, and/or the need to delay or suspend sampling because of hazardous weather conditions. If a station cannot be re-occupied, a new location will be selected from one of the locations sampled during the fall 2009 field effort upon agreement between USEPA and CPG. The CPG will immediately suspend operations under conditions of extreme weather and/or environmental conditions that are a threat to worker health and safety.

## QAPP Worksheet No. 11. Project Quality Objectives/Systematic Planning Process Statements

<b>What will the data be used for?</b>
The data collected during the spring and summer 2010 benthic invertebrate community surveys will be used in conjunction with information from the fall 2009 survey to provide qualitative information on seasonal changes in the benthic invertebrate community in the LPRSA.
<b>What types of data are needed?</b>
Data collected will include a qualitative assessment of seasonal changes in the benthic community structure data (e.g., total number of taxa [e.g., species] present and the abundance of each species or specific taxonomic group) at a subset of the locations sampled during the fall 2009 benthic invertebrate community survey.
<b>Matrix</b>
Benthic invertebrate community data, including total number of taxa (e.g., species) present and the abundance of each species or specific taxonomic group, will be compiled for the spring and summer 2010 benthic invertebrate community surveys.
<b>How “good” do the data need to be in order to support the environmental decision?</b>
The spring and summer 2010 benthic invertebrate community surveys are designed to provide a qualitative assessment of seasonal changes in the benthic invertebrate community in the LPRSA. The invertebrates will be identified to lowest practical taxonomic level, generally genus or species level unless the organisms are damaged, incomplete, or juveniles, which may preclude identification to this level. The taxonomic level will adhere to the level presented in Table 11-1 of the Benthic QAPP (Windward 2009), which is based on other benthic invertebrate surveys in New Jersey.
<b>How many data are needed?</b>
Benthic invertebrate community data will be collected from 33 locations identified for the spring and summer 2010 benthic community surveys. These locations are a subset of the 102 locations sampled during the fall 2009 benthic invertebrate community survey. The rationale for the selection of the 33 locations that will be revisited during the spring and summer 2010 surveys is provided in Worksheet No. 18 of this addendum. Four replicate benthic invertebrate community samples will be collected at each location. Taxonomical analysis will be conducted on three of the replicates, and the fourth replicate at each location will be archived for 1 year after collection.

## QAPP Worksheet No. 11. Project Quality Objectives/Systematic Planning Process Statements

<b>Where, when, and how should the data be collected/generated?</b>
The selected sampling locations (and the rationale for each location) for the spring and summer 2010 benthic invertebrate community surveys are presented in Worksheet No. 18 of this addendum and illustrated in Figure 1. Methods used to collect samples will follow the standard operating procedures (SOPs) detailed in Attachment D: SOP—Collection and Processing of Sediment Grab Samples, which was included in the Benthic QAPP (Windward 2009).
<b>Who will collect and generate the data?</b>
Windward will provide the field sampling coordination and most of the field personnel required to conduct the spring and summer 2010 benthic invertebrate community surveys. Windward will be supported by its contractors Research Support Services, Inc., and Aqua Survey, Inc., as well as de maximis, inc., and AECOM field personnel, as required.
<b>How will the data be reported?</b>
Updates will be communicated (e.g., via telephone conversation, e-mail) to CPG project managers and project coordinators. An electronic database that includes the coordinates for the sampling locations, the times of sampling, sampling depths, and a list of taxa (e.g., species) present at each location will be maintained. A data summary report presenting the abundance and diversity of benthic invertebrates collected will be provided within 90 working days after the completion of each benthic invertebrate community survey. The data summary reports will document any modifications to the proposed sampling plan outlined in this Benthic QAPP Addendum No. 1.
<b>How will the data be archived?</b>
Data records, forms, and notes will be scanned and stored electronically in a project file. Hard copies will be archived at Windward's main office in Seattle, Washington. Similarly, once the data reports have been issued, they will be archived electronically and as hard copies.

**QAPP Worksheet No. 18. Proposed Sampling Locations and Methods/SOP Requirements Table**

Sampling Location/ID Number	Easting (X) <sup>a</sup>	Northing (Y) <sup>a</sup>	Substrate <sup>b</sup>	Water Depth <sup>c</sup>	Collection and Processing Method	Rationale for Sampling Location <sup>d</sup>
LPRT01B	596576	685868	Fine	Deep subtidal	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Deep location with fine substrate, low abundance ( $\leq 610$ individual organisms), and low richness ( $\leq 5$ taxa)
LPRT01E	598155	686825	Coarse	Shallow nearshore	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Shallow location with coarse substrate, high abundance ( $\geq 2,000$ individual organisms), and high richness ( $\geq 10$ taxa)
LPRT02A	597097	689108	Fine	Deep subtidal	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Deep location with fine substrate, low abundance ( $\leq 610$ individual organisms), and high richness ( $\geq 10$ taxa)
LPRT02D	597341	690144	Fine	Shallow nearshore	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Shallow location with fine substrate, moderate abundance ( $> 610$ individual organisms and $< 2,000$ individual organisms), and high richness ( $\geq 10$ taxa)
LPRT03C	596852	695169	Fine	Shallow nearshore	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Shallow location with fine substrate, moderate abundance ( $> 610$ individual organisms and $< 2,000$ individual organisms), and moderate richness ( $> 5$ taxa and $< 10$ taxa)
LPRT03D	594769	695712	Coarse	Deep subtidal	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Deep location with coarse substrate, low abundance ( $\leq 610$ individual organisms), and moderate richness ( $> 5$ taxa and $< 10$ taxa)
LPRT04A	591558	694914	Coarse	Shallow nearshore	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Shallow location with coarse substrate, moderate abundance ( $> 610$ individual organisms and $< 2,000$ individual organisms), and moderate richness ( $> 5$ taxa and $< 10$ taxa)
LPRT04C	590739	693152	Coarse	Deep subtidal	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Deep location with coarse substrate, moderate abundance ( $> 610$ individual organisms and $< 2,000$ individual organisms), and low richness ( $\leq 5$ taxa)
LPRT05A	588923	692186	Fine	Shallow nearshore	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Shallow location with fine substrate, high abundance ( $\geq 2,000$ individual organisms), and high richness ( $\geq 10$ taxa)

**QAPP Worksheet No. 18. Proposed Sampling Locations and Methods/SOP Requirements Table**

Sampling Location/ID Number	Easting (X) <sup>a</sup>	Northing (Y) <sup>a</sup>	Substrate <sup>b</sup>	Water Depth <sup>c</sup>	Collection and Processing Method	Rationale for Sampling Location <sup>d</sup>
LPRT05B	588806	692284	Fine	Deep subtidal	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Deep location with fine substrate, low abundance ( $\leq 610$ individual organisms), and moderate richness ( $> 5$ taxa and $< 10$ taxa)
LPRT06A	585109	694420	Fine	Shallow nearshore	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Shallow location with fine substrate, high abundance ( $\geq 2,000$ individual organisms), and moderate richness ( $> 5$ taxa and $< 10$ taxa)
LPRT06C	584809	697060	Coarse	Deep subtidal	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Deep location with coarse substrate, high abundance ( $\geq 2,000$ individual organisms), and moderate richness ( $> 5$ taxa and $< 10$ taxa)
LPRT07A	584959	699966	Coarse	Deep subtidal	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Deep location with coarse substrate, high abundance ( $\geq 2,000$ individual organisms), and moderate richness ( $> 5$ taxa and $< 10$ taxa)
LPRT07C	585854	702891	Fine	Shallow nearshore	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Shallow location with fine substrate, low abundance ( $\leq 610$ individual organisms), and low richness ( $\leq 5$ taxa)
LPRT08C	587977	706328	Fine	Shallow nearshore	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Shallow location with fine substrate, high abundance ( $\geq 2,000$ individual organisms), and high richness ( $\geq 10$ taxa)
LPRT08E	589181	708325	Coarse	Deep subtidal	Power grab, 0.1-m <sup>2</sup> sample area and 1.0-mm sieve	Deep location with coarse substrate, moderate abundance ( $> 610$ individual organisms and $< 2,000$ individual organisms), and moderate richness ( $> 5$ taxa and $< 10$ taxa)
LPRT09C	590070	712127	Coarse	Deep subtidal	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Deep location with coarse substrate, high abundance ( $\geq 10,000$ individual organisms), and moderate richness ( $> 10$ taxa and $< 14$ taxa)
LPRT9D	590259	712377	Fine	Shallow nearshore	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Shallow location with fine substrate, moderate abundance ( $> 5,000$ individual organisms and $< 10,000$ individual organisms), and low richness ( $\leq 10$ taxa)

**QAPP Worksheet No. 18. Proposed Sampling Locations and Methods/SOP Requirements Table**

Sampling Location/ID Number	Easting (X) <sup>a</sup>	Northing (Y) <sup>a</sup>	Substrate <sup>b</sup>	Water Depth <sup>c</sup>	Collection and Processing Method	Rationale for Sampling Location <sup>d</sup>
LPRT10C	592365	716573	Coarse	Deep subtidal	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Deep location with coarse substrate, high abundance (≥ 10,000 individual organisms), and moderate richness (> 10 taxa and < 14 taxa)
LPRT10E	591962	718192	Fine	Shallow nearshore	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Shallow location with fine substrate, high abundance (≥ 10,000 individual organisms), and high richness (≥ 14 taxa)
LPRT11D	592541	722400	Coarse	Shallow nearshore	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Shallow location with coarse substrate, high abundance (≥ 10,000 individual organisms), and high richness (≥ 14 taxa)
LPRT11E	592967	723060	Fine	Shallow nearshore	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Shallow location with fine substrate, moderate abundance (> 5,000 individual organisms and < 10,000 individual organisms), and low richness (≤ 10 taxa)
LPRT12A	594063	723589	Fine	Deep subtidal	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Deep location with fine substrate, low abundance (≤ 5,000 individual organisms), and moderate richness (> 10 taxa and < 14 taxa)
LPRT12E	596571	725383	Coarse	Shallow nearshore	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Shallow location with coarse substrate, moderate abundance (> 5,000 individual organisms and < 10,000 individual organisms), and low richness (≤ 10 taxa)
LPRT13E	596402	729620	Coarse	Shallow nearshore	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Shallow location with coarse substrate, high abundance (≥ 10,000 individual organisms), and moderate richness (> 10 taxa and < 14 taxa)
LPRT13F	596107	730761	Coarse	Deep subtidal	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Deep location with coarse substrate, low abundance (≤ 5,000 individual organisms), and moderate richness (> 10 taxa and < 14 taxa)

### QAPP Worksheet No. 18. Proposed Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Easting (X) <sup>a</sup>	Northing (Y) <sup>a</sup>	Substrate <sup>b</sup>	Water Depth <sup>c</sup>	Collection and Processing Method	Rationale for Sampling Location <sup>d</sup>
LPRT14A	596907	733031	Coarse	Shallow nearshore	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Shallow location with coarse substrate, moderate abundance (> 5,000 individual organisms and < 10,000 individual organisms), and moderate richness (> 10 taxa and < 14 taxa)
LPRT14C	597247	734741	Coarse	Deep subtidal	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Deep location with coarse substrate, high abundance (≥ 10,000 individual organisms), and high richness (≥ 14 taxa)
LPRT15D	597548	737935	Coarse	Shallow nearshore	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Shallow location with coarse substrate, moderate abundance (> 5,000 individual organisms and < 10,000 individual organisms), and high richness (≥ 14 taxa)
LPRT15E	598710	738396	Coarse	Deep subtidal	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Deep location with coarse substrate, low abundance (≤ 5,000 individual organisms), and high richness (≥ 14 taxa)
LPRT16C	600942	737737	Coarse	Shallow nearshore	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Shallow location with coarse substrate, moderate abundance (> 5,000 individual organisms and < 10,000 individual organisms), and moderate richness (> 10 taxa and < 14 taxa)
LPRT16D	600858	739273	Coarse	Shallow nearshore	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Shallow location with coarse substrate, moderate abundance (> 5,000 individual organisms and < 10,000 individual organisms), and high richness (≥ 14 taxa)
LPRT17D	598581	743897	Coarse	Shallow nearshore	Power grab, 0.05-m <sup>2</sup> sample area and 0.5-mm sieve	Shallow location with coarse substrate, moderate abundance (> 5,000 individual organisms and < 10,000 individual organisms), and high richness (≥ 14 taxa)

<sup>a</sup> New Jersey State Plane (US survey ft).

<sup>b</sup> Fine substrate refers to fine-grained sediment ≥ 60% fines, defined as the sum of clay and silt particles having a diameter less than 63 µm based on the evaluation of preliminary grain-size data from the fall 2009 field effort), and coarse substrate refers to coarse-grained sediment (< 60% fines) based on an evaluation of preliminary grain-size distribution data from the fall 2009 field effort.

### **QAPP Worksheet No. 18. Proposed Sampling Locations and Methods/SOP Requirements Table**

- <sup>c</sup> Shallow nearshore water depth refers to shallow nearshore areas that are -2 ft MLLW and shallower, and deep subtidal water depth refers to subtidal areas deeper than -2 ft MLLW.
  - <sup>d</sup> Abundance and richness information is from data collected at these locations during the fall 2009 benthic invertebrate community survey.
- ID – identification  
MLLW – mean lower low water  
SOP – standard operating procedure



## **References**

---

Windward. 2009. Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. Quality Assurance Project Plan: Surface sediment chemical analyses and benthic invertebrate toxicity and bioaccumulation testing. Final. Prepared for Cooperating Parties Group, Newark, New Jersey. October 8, 2009. Windward Environmental LLC, Seattle, WA.

## **Oversize Figure**



